



PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Improvements in and relating to Shaped Fabric Articles

We, TRUBENISED LIMITED, a British Company, of 17—18, Old Bond Street, London, W.1, and LAJOS BIHALY, a Hungarian Subject, of the Company's address aforesaid, do hereby declare the nature of this invention to be as follows:—

This invention relates to multiply fabrics of the kind which consist in general of a backing or lining material containing elements of a cellulose derivative or equivalent material superimposed upon or sandwiched between linen or like fabric and then amalgamated by means of pressure and/or heat and suitable plasticisers or solvents for the cellulose derivative.

The object of the present invention is to provide a fabric for use in the making of shaped articles which will be washable and porous and which, moreover, can, during the process of manufacturing shaped articles, be sufficiently stretched as to enable it to be moulded to the desired shape without pleating or wrinkling and then processed, so that the desired shape or form is permanently maintained. Such a material would be particularly advantageous in the manufacture of ladies' brassieres as will hereafter appear.

The invention consists therefore of a special composite material comprising essentially a knitted fabric of cotton threads and cellulose acetate or like threads and the invention further comprises shaped articles consisting of this special lining or backing material amalgamated with a layer or layers of knitted linen or like material having a degree of stretchability comparable with the stretchability of the composite material so that the superimposed layers can be stretched to the desired form without pleating or wrinkling and after processing will maintain that form.

In carrying the invention into practice according to the preferred method, the special composite material is formed by knitting with double strands, one of the strands being of cotton and the other of the cellulose derivative.

The result of this is a stretchable material having the cellulose strands

lying alongside or crossing the cotton strands at a multiplicity of points. If a sheet of this material is superimposed on a loosely woven or knitted stretchable fabric layer, or interposed between two such layers, and then processed in the manner, for example, described in the Specification of Letters Patent No. 419,208; a substantially stiff sheet will result which will be washable and porous. Such a sheet in itself possesses no particular advantage but where it is desired that the composite material be given a special form the advantage becomes apparent. Take, for example, the case of a lady's brassiere already mentioned.

In manufacturing such an article according to one method the two or three layers of material, one of which is of the special backing or lining material containing the cellulose derivative, are superimposed and arranged upon a frame, for example by impaling on pins projecting from the frame border and the superimposed structure is then treated with a solvent for the cellulose derivative—or a wetting agent for the plasticiser if the material has been plasticised, for example by dipping the frame in the solvent or wetting agent. The frame, which may, of course, be provided with a suitable handle, is then positioned on the top of the female element of a mould of the desired shape. The male part of the mould, corresponding in contour with the female part, is then moved into register with the female part of the mould stretching the stretchable fabric structure to the mould shape. On final closure of the mould the fabric structure will be subjected to the heat and pressure and the amalgamation of the plies and the shaping simultaneously effected. The heating of the mould parts may be effected by means of steam introduced into internal recesses in the mould parts. Two breast formations may, of course, be formed as an integral structure but in commercial use a number of these formations of two or three different sizes can be mass-produced and brassieres built up from them, the connection between the breast formation and the shoulder straps

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of the brassières being provided with means of adjustment to facilitate fitting to the figure of the person for whom a particular brassière is intended.

Dated this 1st day of February, 1943.

A. A. THORNTON,

Chartered Patent Agent,
7, Essex Street, Strand, London, W.C.2,
For the Applicants.

COMPLETE SPECIFICATION

Improvements in and relating to Shaped Fabric Articles

5 We, TRUBENISED LIMITED, a British Company, of 17—18, Old Bond Street, London, W.1, and LAJOS BIHALY, a Hungarian Subject, of the Company's address aforesaid, do hereby declare, the
10 nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to shaped fabric
15 articles produced by forming material comprising elements of a thermoplastic material to a desired shape and is particularly concerned with breast cups for brassières.

20 The main desiderata for such articles are that they should be washable, reasonably permeable to air and moisture and that they should maintain their shape without being unduly rigid and it is the
25 object of the present invention to provide shaped articles of this type which meet these requirements and to provide a method by means of which they can be expeditiously and economically manufac-
30 tured.

Numerous methods of accomplishing this object have been suggested based on the broad idea of stretching a fabric com-
35 posed of thermoplastic and non-thermo- plastic elements to the desired shape as in a mould and securing the shape permanently by the application of heat and pressure.

It has been suggested to employ in such
40 processes woven or knitted fabrics comprising compound strands of thermo- plastic and non-thermoplastic material made, for example, by intertwining or
45 spinning together the two components, and to form shaped textile articles by assembling and amalgamating a plurality of woven or knitted fabrics, one of which contains yarns of or containing a thermo-
50 plastic material.

It has also been proposed to employ as the thermoplastic material cellulose acetate or other cellulose derivative, to assist the union of the threads by apply-
55 ing thereto a solvent for the thermoplastic material, to employ yarns containing thermoplastic materials which have been plasticised, and also to shape the articles by stretching the material over the male part of a moulding direct, pressing the

male part of the mould into contact with the female part, and permanently estab-
60 lishing the shape of the article by injecting steam or solvent vapours into mould cavities.

The present invention differs from all
65 the prior proposals with which we are familiar in that the material we employ is essentially knitted from a double com-
70 posite strand. That is to say the knitting is effected by simultaneously knitting double strands, one of which is composed of thermoplastic material and the other of non-thermoplastic material, the two
75 strands lying alongside each other, but being separate and capable of relative movement one to the other.

Such material has the advantage that it can be quickly stretched to the three
80 dimensional shape without the aid of heat and without any danger of fracturing the strands, the shape can then be per-
85 manently fixed by the application of pressure accompanied by heat and the use of solvents or wetting agents for a plasticiser where necessary depending of course on the particular nature of the thermoplastic material employed.

The invention therefore consists of breast cups for brassières and like three
90 dimensional articles composed of fabric consisting of thermoplastic and non-thermoplastic elements stretched to the desired shape and fixed in the stretched
95 shape by the application of heat and pressure characterised in that the material employed is knitted from a double com-
100 posite strand which consists of separate strands lying alongside each other and knitted together simultaneously, one of the strands being of thermoplastic material and the other of non-thermo-
105 plastic material, and is such that it can be stretched to the desired three dimensional shape without the aid of heat and then caused to maintain said desired shape
110 permanently by treatment to render the thermoplastic component of the double strands adhesive followed by pressure accompanied by heat, if necessary, caus-
ing the thermoplastic and non-thermo-
115 plastic strands of the material to be fused together at positions where the loops of the stretched knitting cross.

The invention further comprises the

construction of said three dimensional articles wherein the stretchable composite material is amalgamated with a substantially equally stretchable non-thermo-
 5 plastic material and still further comprises the process by which such articles are made.

The non-thermoplastic threads may be of cotton, linen, regenerated cellulose of the viscose type, silk wool, or the like,
 10 and the thermoplastic threads may be of a cellulose derivative such as cellulose acetate.

In order that the invention may be more readily understood and carried into practice reference is hereby made to the accompanying drawings wherein:—

Figure 1 is a diagrammatic representation of a suitable structure for the knitted composite thermoplastic and non-thermo-
 20 plastic material employed in the invention;

Figure 2 is a diagrammatic representation showing the structure of the material of Figure 1 after it has been stretched, the two lower rows in the Figure indicating how after the completion of the fusion process the points of crossing of the loops become permanently fixed;

Figure 3 is a diagrammatic section of apparatus suitable for carrying out the invention as applied to the manufacture of breast cups for a brassière;

Figure 4 is a perspective view of an accessory device for use with the apparatus; and

Figure 5 is a perspective view of a brassière manufactured from shaped breast cups manufactured according to the invention.

Referring to the drawings and particularly to Figure 1 which shows to an enlarged scale the structure of the composite material employed which is formed by knitting, in known manner, with double strands, one of the strands C being of cotton and the other A of a thermoplastic cellulose derivative.

The result of this is a stretchable material having cellulose derivative strands lying alongside cotton strands and crossing these at a multiplicity of points. This material may be knitted on a circular knitting machine. If the fabric is stretched the loops and their crossing points will slip relatively to each other, and the crossing points B will be in a position shown, for example, in the upper row of Figure 2.

If, when in this stretched condition, fusion of the cellulose derivative is effected the crossing or interengaging points of the loops will become permanently fixed, as indicated at B in the two lower rows of Figure 2, and the

material will permanently maintain the shape to which it was stretched before fusion.

The drawings, which are, of course, diagrammatic for the purposes of explanation only indicate the case where the material is stretched in its plane. Thus the displacement of the crossing points is indicated as being regular. The material can, however, and will according to the present invention be stretched out of its plane; that is to say by a force applied at right angles to its plane. Thus an article will be produced having a globular or three-dimensional shape which is permanently maintained by the fixing by fusion, of the multitudinous crossing points of the knitted loops in their displaced positions.

If this cellulose-derivative cotton fabric is of a sufficiently heavy knit it can be used for shaped articles without any addition. If, as is preferred, a sheet of this material with the cellulose derivative appearing on at least one of the surfaces is superimposed on a knitted or loosely woven backing of equally stretchable cotton, linen or other suitable fabric layer, or interposed between two such layers, stretched to a predetermined shape and then processed by treatment with a solvent followed by the application of pressure accompanied by heat in the manner described, for example, in the Specification of Letters Patent No. 419,208, a substantially stiffened and permanently shaped but flexible product will result, the outer appearance of which is independent of the interlining and the backing. Such a product is of great advantage, for example in the case of a lady's brassière, with which, as before indicated, the invention is particularly concerned.

In manufacturing such an article according to one method the two or three layers of material, at least one of which is the special knitted backing or lining material containing the cellulose derivative, are superimposed and arranged upon a frame, such as shown in Figure 4 for example by impaling on pins *a* projecting from the frame border *b* and the superimposed structure *c* is then treated with a solvent for the cellulose derivative such as acetone where the cellulose derivative is cellulose acetate—or a wetting agent for the plasticiser, such as alcohol, if cellulose acetate material has been plasticised—for example, by dipping the frame with the material impaled upon it, in the solvent or wetting agent. The frame, provided with a suitable handle *d* is then positioned on top of the female part *c* (Figure 3) of a mould of the desired shape

and may advantageously be clamped in position by the clamping frame *b1* held in position by the swivel clamps *b2*. The advantage of this clamping is that it prevents any tendency of the fabric layer or layers to tear from the pins *a*. The male part *f* of the mould, corresponding in contour with the female part *e*, is then moved towards register with the female part of the mould, stretching the stretchable fabric structure substantially to the mould shape. This can be effected quite quickly as no heating of the material is required to render it stretchable. On final closure of the mould the fabric structure will be subjected to pressure and heat, thus effecting the amalgamation of the plies and the fixing of the shape. The heating of the mould parts may be effected by means of steam introduced into internal recesses in the mould parts by way of flexible inlet and exhaust pipes *g* and *h* respectively. Two breast formations may, of course, be formed as an integral structure but in commercial use a number of these single formations of two or three different sizes can be mass-produced and brassières built up from them. One suitable arrangement is shown in Figure 5, which illustrates two breast elements *i* made in the manner aforesaid, connected to a back support *j* and having a front adjusting lacing *k* and shoulder straps *l* having adjusting buckles *m*.

It is to be understood that no claim is made in this Application to the construction of brassière shown in Figure 5 since it forms the subject of Application No. 5711/45 (Serial No. 576,522) divided from this Application.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Breast cups for brassières and like three dimensional articles composed of fabric consisting of thermoplastic and non-thermoplastic elements stretched to the desired shape and fixed in the stretched shape by the application of heat and pressure, characterised in that the material employed is knitted from a double composite strand which consists of separate strands lying alongside each other and knitted together simultaneously, one of the strands being of thermoplastic material and the other of non-thermoplastic material, and is such that it can be stretched to the desired three dimensional shape without the aid of heat and then caused to maintain said desired shape permanently by treatment to render the thermoplastic component of the double strands adhesive followed by

pressure accompanied by heat, if necessary, causing the thermoplastic and non-thermoplastic strands of the material to be fused together at positions where the loops of the stretched knitting cross.

2. Breast cups for brassières and like three dimensional shaped articles according to claim 1, wherein said stretchable fabric is amalgamated with a fabric or fabrics of non-thermoplastic material having a factor of stretchability substantially equal to that of the composite knitted fabric.

3. A process of manufacturing breast cups for brassières and shaped articles as claimed in claim 1 or 2, according to which the composite knitted fabric is first stretched by the male part of a mould without the aid of heat, to the desired three dimensional shape and is then permanently established in that shape by pressure of the male part of the mould into contact with the female part of the mould, accompanied by heat, after the thermoplastic component of the stretched knitted fabric has been rendered adhesive under the action of a solvent or softening agent.

4. A process of manufacturing breast cups for brassières and shaped articles of wearing apparel according to claim 3, wherein the thermoplastic constituent of the fabric is a cellulose derivative and is rendered adhesive by treatment with a solvent.

5. A process of manufacturing breast cups for brassières and shaped articles of wearing apparel according to claim 3, wherein the thermoplastic constituent of the fabric has been plasticised and the fabric is treated by a wetting agent for the plasticiser prior to the application of pressure or pressure accompanied by heat.

6. A shaped article of wearing apparel such as a brassière according to claim 1 or 2 having shaped parts comprising a knitted fabric of thermoplastic cellulose derivative strands and cotton or like non-thermoplastic strands, which fabric has been rendered adhesive by a solvent or agent for softening the cellulose derivative and subsequently stretched to the desired shape and when in its stretched condition subjected to the action of heat and pressure, whereby the stretched shape is permanently established by reason of the fusing of the knitted loops together in their displaced positions at a multiplicity of points.

7. A method of making shaped articles of wearing apparel as claimed in claim 1 or 2, according to which superimposed plies or layers of stretchable fabric, one of which is a knitted fabric and comprises separate threads or strands of thermo-

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plastic derivative and cotton or like non-thermoplastic material are treated with a solvent or agent for softening the cellulose derivative and supported between
5 heated male and female parts of a mould in such a manner that movement at the border is prevented, the male part of the mould then being moved into engagement with the female part whereby the assembly is first stretched to the approximate
10 shape of the mould and then finally sub-

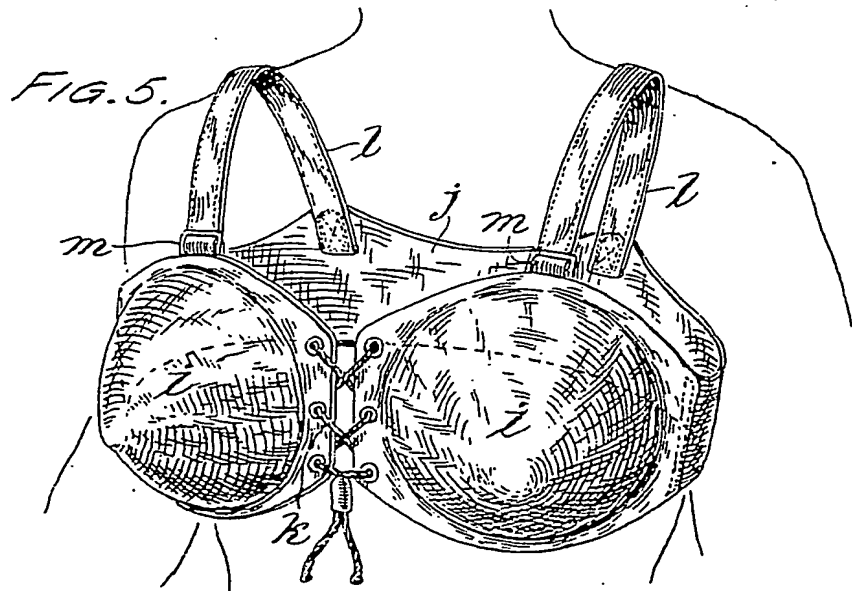
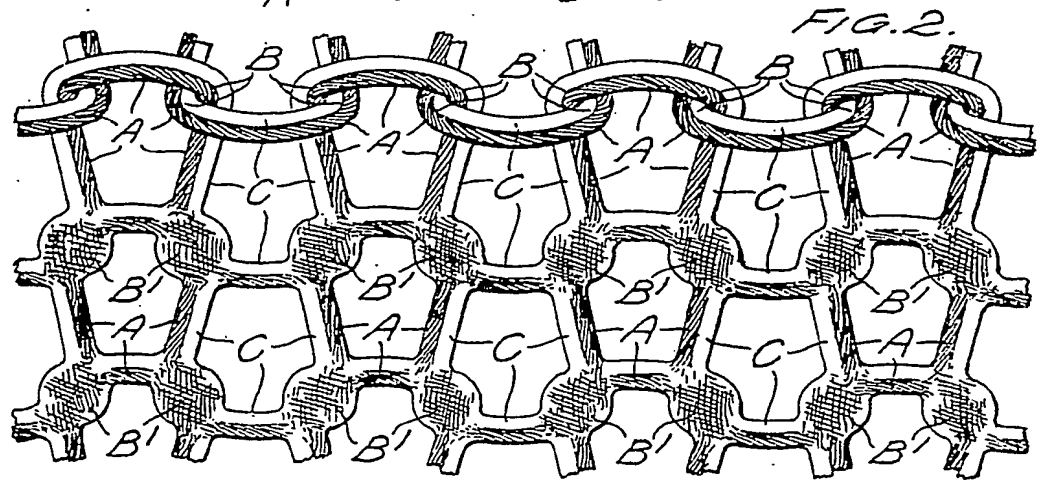
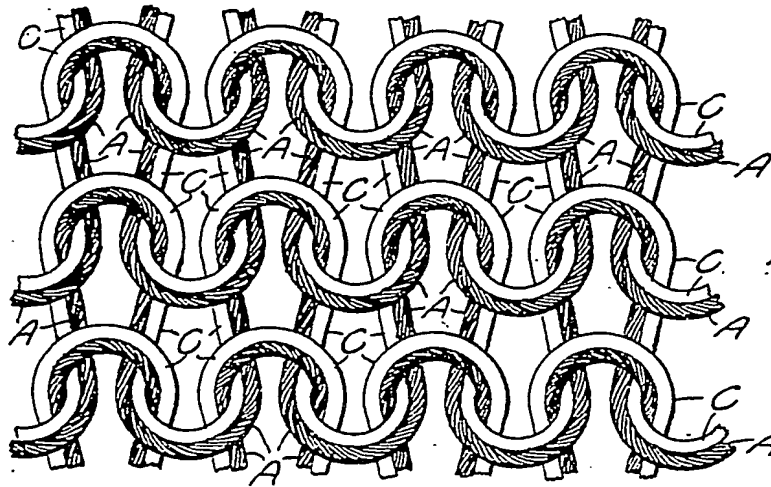
jected to pressure between the male and female portions of the heated moulds, whereby the assembly adopts and maintains the precise shape imparted to it by
15 the mould.

Dated this 1st day of March, 1944.

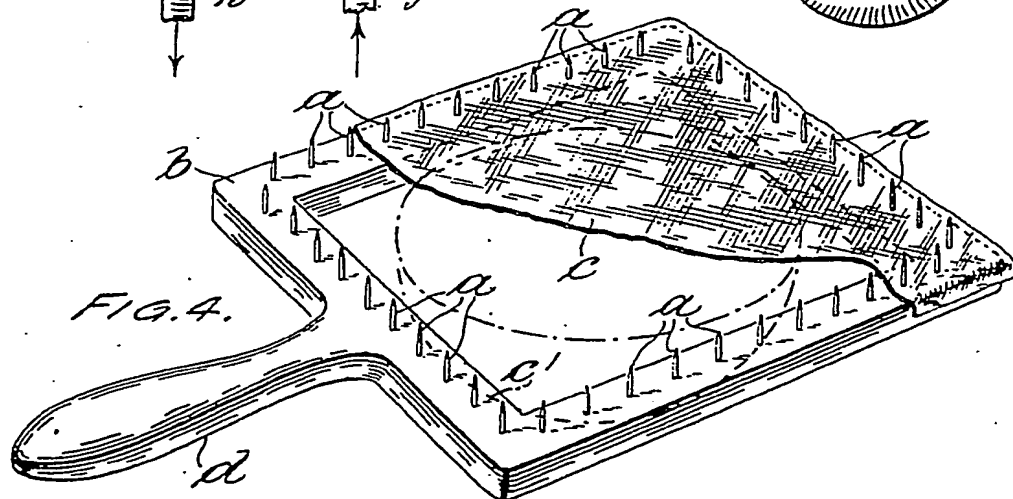
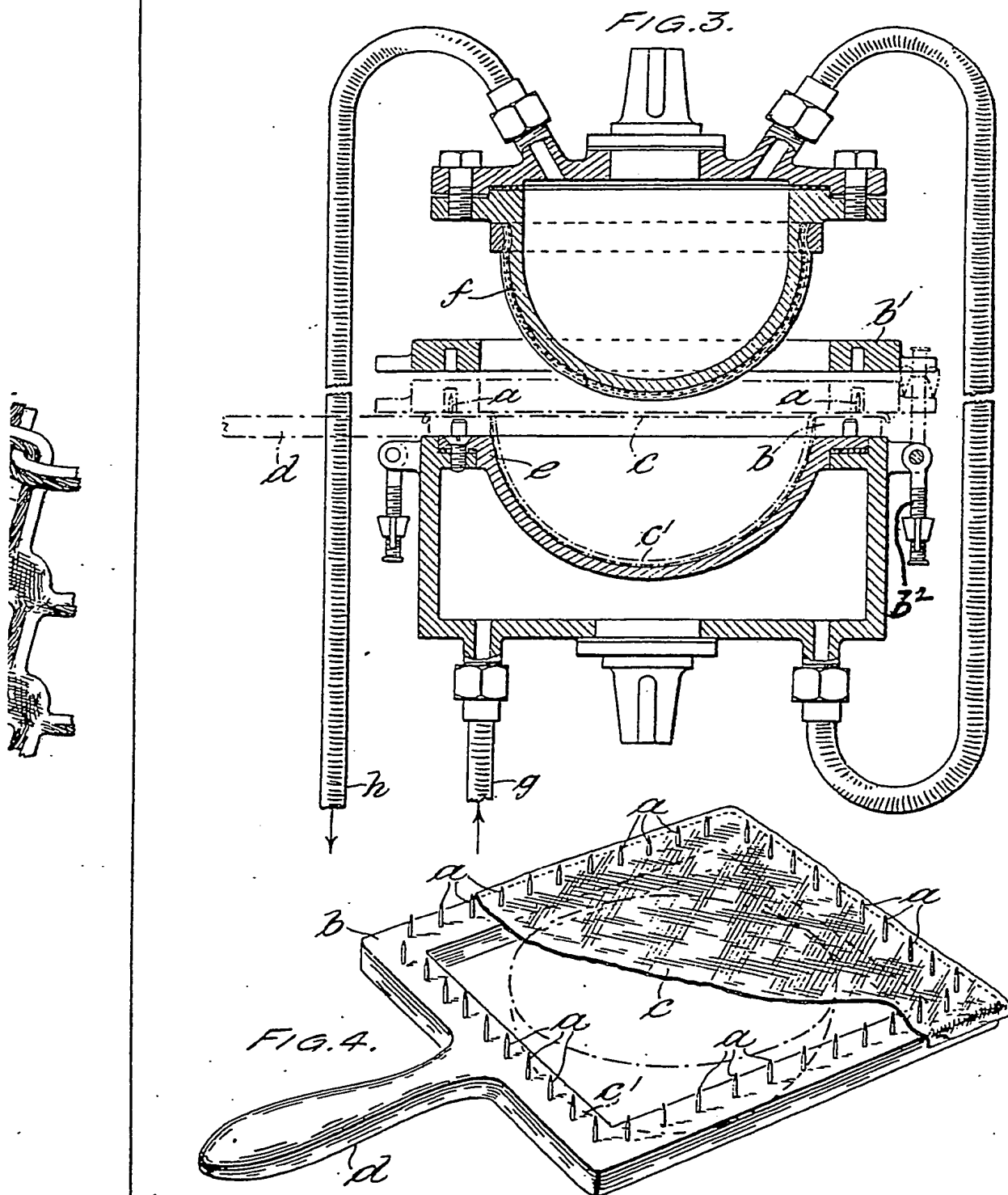
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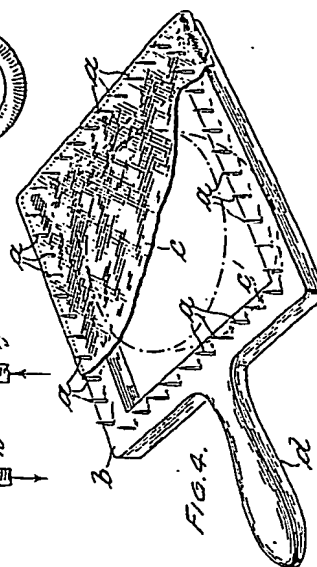
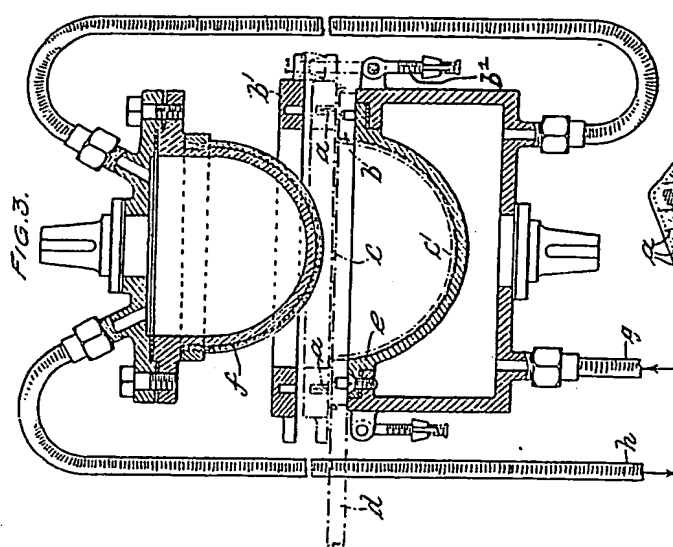
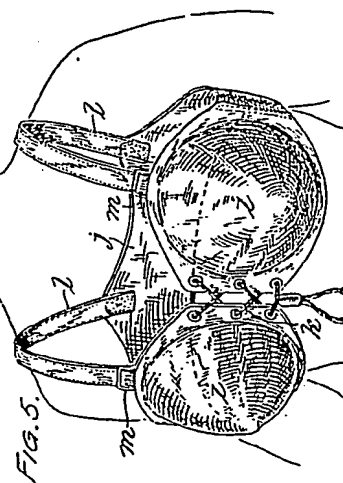
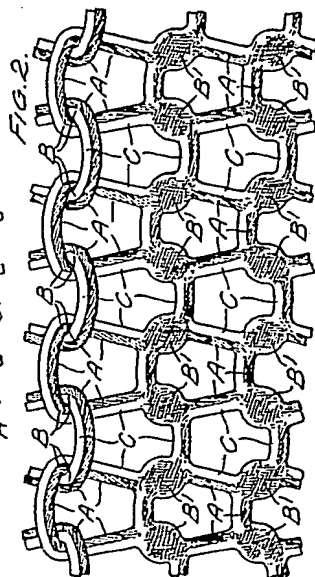
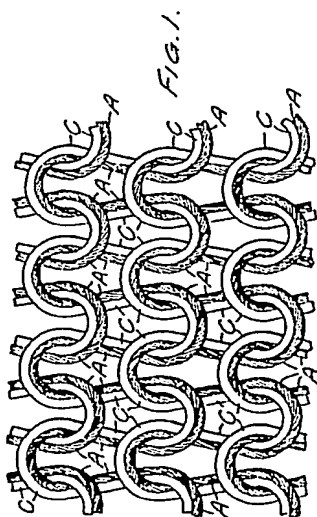
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